

## **CHAPTER 4 PRELIMINARY COST ESTIMATE**

### **4.1 Introduction**

This chapter presents preliminary cost estimates for NODOS Project Alternatives A, B, and C described in Chapter 3. Table 4-1 provides a list of the major project components for each alternative that are included in the cost estimates.

The preliminary construction cost estimates presented in this chapter include contract costs, contingencies, and non-contract costs for all facilities shown on Table 4-1, and other allowances for items such as environmental mitigation, and temporary and permanent easement acquisition. Key estimating assumptions are also discussed in this chapter.

The estimates of project cost provided in this chapter are based upon a compilation of existing estimates prepared by DWR or its consultants. These estimates reflect the current conceptual level of project design. The only changes made to existing estimates include adding new project features (such as the Holthouse Reservoir) or modifying the original estimates to reflect design updates (such as changing pumping units at the Sites Pumping Plant to pumping/generating units). Estimates also have been updated to 2013 price levels.

Complete cost estimates are provided for the three project alternatives. It is assumed that this cost information will be combined with other analyses and evaluations to identify a preferred project and that additional design and cost estimating will be performed to confirm the feasibility of the project. To support that work, additional field investigations and construction material evaluations should be performed. The actual project construction cost ultimately will depend upon the final design details of the preferred project alternative, and the labor and material costs, market conditions, and other variable factors existing at the time of bid. Accordingly, the final project cost will vary from the preliminary estimates presented in this chapter. The cost estimates presented in this chapter are suitable for estimating benefit-cost ratios and comparing project alternatives. However, these estimates should not be used for budgeting or financial planning of any sort for the project. Future cost estimate refinements will be based upon enhanced design information, Value Planning Study proposals, and updated quantity calculations.

### **4.2 Level and Classification of Cost Estimates**

The cost estimates presented in this chapter are considered to be Class 4 estimates as defined by the Association for Advancement of Cost Engineering. Class 4 estimates are generally prepared based on limited information and can have wide accuracy ranges. Typically, engineering is anywhere from 1 to 5 percent complete. Class 4 estimates are generally used for determining project pre-feasibility, market studies, project screening, and preliminary budget approval. Expected accuracy ranges for Class 4 efforts are from 15 to 30 percent on the low side, to 20 to 50 percent on the high side, depending on the complexity of the project, quality of reference information, and the inclusion of appropriate contingency allocations.

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**Table 4-1. Alternative Project Components**

Facility	Project Alternative		
	A	B	C
Sites Reservoir Clearing and Demolition	•	•	•
Sites Dam	•	•	•
Golden Gate Dam	•	•	•
Saddle Dams			
Saddle Dam 1	•	•	•
Saddle Dam 2		•	•
Saddle Dam 3	•	•	•
Saddle Dam 4		•	•
Saddle Dam 5	•	•	•
Saddle Dam 6	•	•	•
Saddle Dam 7		•	•
Saddle Dam 8		•	•
Saddle Dam 8A and 8B	•		
Golden Gate Saddle Dam	•		
Saddle Dam 9		•	•
Signal Spillway at Saddle Dam 6	•	•	•
Sites Reservoir Inlet/Outlet			
Tunnel	•	•	•
Inlet/Outlet Structure	•	•	•
Access Road	•	•	•
Sites Pumping/Generating Plant			
Pumping/Generating Plant	•	•	•
Emergency Drawdown Bypass	•	•	•
Plant Access Road	•	•	•
Temporary Bypass T-C Canal	•	•	•
Holthouse (Enlarged Funks) Reservoir	•	•	•
TRR Reservoir	•	•	•
TRR Pumping/Generating Plant	•	•	•
TRR Pipeline	•	•	•
Delevan Pipeline	•	•	•
Sacramento River Release-Only Structure		•	
Sacramento River Pumping/Generating Plant			
Pumping/Generating Plant	•		•
Fish Screen Facility	•		•
Project Access Roads and Bridges			
Access Roads (Public and Private)	•	•	•
South Bridge	•	•	•
Electrical Transmission (230-kV Option)	•	•	•
Recreation (3 initial areas)	•	•	•

GCID = Glenn-Colusa Irrigation District

kV = kilovolts

T-C = Tehama-Colusa

TRR = Terminal Regulating Reservoir

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## **4.3 Cost Estimate Considerations**

### **4.3.1 Estimating Terminology**

**Contract Costs:** Contract costs include detailed quantity and unit price estimates, plus allowances for mobilization/demobilization and unlisted items.

**Contingency:** Contingency is estimated as a percentage of the contract cost.

**Field Cost:** The field cost is the sum of the contract cost and contingency.

**Non-Contract Costs:** Non-contract costs include engineering, administration, legal services, and permitting costs.

**Construction Cost:** The construction cost is the sum of the field cost and non-contract costs.

### **4.3.2 Construction Cost Components**

#### ***Contract Cost***

The contract cost estimates presented in this chapter were compiled using individual estimate worksheets for project components prepared by DWR. These estimates were initially prepared in 2002 and some have been updated to 2005 and 2007 price levels. Where DWR estimate worksheets were not available for project features (such as roads and bridges, and Delevan Pipeline Intake Facilities), cost estimates found in preliminary feasibility study documents prepared by DWR or its consultants were used and the base year for the estimate was assumed to be the year that the study was prepared. For new features recently added (such as the Holthouse Reservoir), quantities were estimated based upon available concept drawings and cost estimates were developed. A constructability review of the preliminary feasibility design for each project alternative was not performed.

In accordance with Reclamation estimating guidelines, an additional allowance of 10 percent of the contract cost for the facility is included in the facility cost to cover unlisted items.

#### ***Escalation***

In 2010, the contract costs for all previous estimates were escalated from the base year (the year and month the estimate was prepared) to 2010 price levels. As described above, some of the previous DWR estimates were escalated to 2005 or 2007 price levels. To do this, DWR applied California Department of Transportation (Caltrans) Price Index data. However, for the estimates presented in this chapter, it is assumed that the current Reclamation Construction Cost Trend (CCT) index factors would be more appropriate as they better represent the actual facilities to be constructed for the project. The CCT factors were applied to the original estimates so that all estimates were escalated to 2010 price levels from the original base using the same escalation method.

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For this Preliminary Design and Cost Estimate Report, the 2010 price levels cost estimates were further escalated to 2013 price levels using the Reclamation CCT index factors.

### ***Contingency***

Contingency is a percentage allowance added to the escalated contract cost. Contingencies are funds for use after construction starts to compensate the contractor for unforeseen or changed site conditions, owner-directed orders for change, quantity overruns, etc. Contingency allowances are generally higher for appraisal-level estimates than for feasibility-level estimates. For the estimates presented in this chapter, an allowance of 20 percent of the 2010 contract cost has been used for contingency.

### **4.3.3 Non-Contract Costs**

Non-contract costs include engineering and design, construction management, project close-out, administration, legal services, permitting, etc. For the estimates presented in this chapter, the non-contract costs were estimated to be 25 percent of the total contract cost. Actual non-contract costs will vary from facility to facility; however, 25 percent is assumed to represent the average value.

### **4.3.4 Other Cost Allowances**

#### ***Environmental Mitigation***

Many environmental laws affect the state's major water supply programs and environmental concerns play a major role in water policy and planning. Costs related to environmental permitting and mitigation have not been fully developed as yet. They will be determined in later stages of the planning process for the selected project alternative as design and construction details are further developed. To prepare the mitigation cost estimates presented in this chapter, a rough estimate was prepared for mitigation for environmental and cultural resource impacts in accordance with National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) requirements based on the mitigations identified in the North-of-the-Delta Offstream Storage Preliminary Administrative Draft Environmental Impact Report.

#### ***Right-of-Way***

ROW costs represent the estimated fair market value of the real estate required for the NODOS Project and do not include staff costs for appraisals or acquisition, damages to the remaining land caused by the acquisition or construction of the project, or utility relocations that may be necessary. ROW cost estimates were based on a study conducted by DWR in 2004 to estimate the cost of land acquisition for Sites Reservoir, conveyance options, and road relocations. These estimates were updated by DWR to 2007 prices using an escalation factor. They were updated to 2010 price levels using the Reclamation CCT index in 2011. For this report, the 2010 price level cost estimates were further updated to 2013 price levels using the Reclamation CCT index.

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### **4.3.5 Assumptions**

Major assumptions made to prepare the preliminary feasibility cost estimates include:

- Competitive market conditions would prevail at the time of bid tender.
- The construction schedule is the current schedule showing construction completion in 2023.
- Environmental mitigation measures would be consistent with those currently used in practice.
- Builder's Risk Insurance would be available to the contractor.
- Materials such as sand, gravel, cement, etc., would remain available within the haul distances used to prepare the estimates.

### **4.3.6 Exclusions**

Major exclusions from the cost estimates include:

- Escalation to midpoint of construction
- Off-site power supply
- Existing infrastructure relocations (except roads)
- Temporary construction ROW and easements
- Temporary haul road and overpass (Interstate 5, railroads and canals)

## **4.4 Cost Estimate Summaries**

The 2010 price level project cost estimates for the three project alternatives are shown on Table 4-3. The 2013 price level project cost estimates for the three project alternatives are shown on Table 4-4. The estimated total annual costs for the three project alternatives at the 2013 price level are shown on Table 4-5.

## **4.5 Value Planning Study**

In September 2012, a Value Planning Study on NODOS was conducted by Reclamation's Value Planning Study Team. The goal of the Value Planning Study is to achieve the most appropriate and highest value solution to the project. The Value Planning Study identified nine proposals shown on Table 4-2 that could reduce the NODOS project construction cost.

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**Table 4-2. Value Planning Study Proposals**

Proposal	Description	Estimated Cost Savings
1	Use Roller-Compacted Concrete for Golden Gate and Sites Dams	\$170,000,000
2	Substitute North Road for South Bridge	\$65,000,000
3	Develop local source for rock	\$90,000,000
4	Move Golden Gate Dam (GGD)'s right abutment to North Bridge, move intake tower and outlet/inlet works near right abutment of GGD, and add a new saddle dam	\$55,000,000
5A	Optimize Delevan Pipeline installation for Alternatives A and C	\$30,000,000
5B	Reduce Delevan Pipeline cover and separation distance for Alternative B	\$37,000,000
6	Reevaluate the design width of the filter system of Golden Gate Dam, Sites Dam, and Saddle dams	\$35,000,000
7	Optimize PG Plants for Wind Solar Services	Not Estimated
8	Omit Kaplan turbines at Terminal Regulating Reservoir (TRR) and Sacramento River Pumping/Generating (SRPGP) plants	\$85,000,000 (Alternatives A & C) \$45,000,000 (Alternative B)
9	Freeboard review for all dams	\$30,000,000

These proposals could result in total project cost savings of \$370 million to \$420 million (\$540 million to \$610 million with 20 percent contingency and 25 percent non-contract costs) for Alternatives A and C, and \$340 million to \$390 million (\$490 million to \$560 million with 20 percent contingency and 25 percent non-contract costs) for Alternative B. These cost saving proposals will be considered and incorporated in the NODOS Feasibility Report.

#### **4.6 Future Estimate Consideration**

The cost estimates discussed in this chapter are considered to be Class 4 estimates. These are considered suitable for evaluating alternative projects at this time. Reclamation is working on a more detailed Class 3 estimate based upon enhanced design information, Value Planning Study proposals, and updated quantity calculations for the draft feasibility report.

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**Table 4-3. Preliminary Cost Estimate Summary – 2010 Price Levels**

Facility	2010 <sup>1</sup> Price Levels (\$)		
	Project Alternative		
	A	B	C
Sites Reservoir Clearing and Demolition	1,523,800	1,686,300	1,686,300
Sites Dam	75,802,900	93,248,600	93,248,600
Golden Gate Dam	142,459,700	217,924,400	217,924,400
Saddle Dams			
Saddle Dam 1	564,500	1,301,600	1,301,600
Saddle Dam 2	Not Required	1,735,500	1,735,500
Saddle Dam 3	29,077,400	64,719,500	64,719,500
Saddle Dam 4	Not Required	291,000	291,000
Saddle Dam 5	10,192,900	31,064,400	31,064,400
Saddle Dam 6	372,000	3,568,400	3,568,400
Saddle Dam 7	Not Required	6,581,200	6,581,200
Saddle Dam 8	Not Required	38,448,600	38,448,600
Saddle Dam 8a <sup>2</sup>	7,809,900	Not Required	Not Required
Saddle Dam 8b	231,400	Not Required	Not Required
Saddle Dam 9	Not Required	759,200	759,200
Signal Spillway at Saddle Dam 6	1,188,000	3,564,000	3,564,000
Sites Reservoir Tunnel and Inlet/Outlet Structures			
Tunnel	96,653,700	96,653,700	96,653,700
Inlet/Outlet Structure	25,141,300	28,132,100	28,132,100
Access Road	1,745,700	1,745,700	1,745,700
Sites Pumping/Generating Plant			
Pumping/Generating Plant	428,164,100	384,723,500	428,164,100
Emergency Drawdown Bypass	35,223,200	35,223,200	35,223,200
Plant Access Road	1,538,500	1,538,500	1,538,500
Temporary Bypass T-C Canal	15,460,700	15,460,700	15,460,700
Holthouse (Enlarged Funks)	120,114,100	120,114,100	120,114,100
TRR Reservoir	40,019,900	40,019,900	40,019,900
TRR Pumping/Generating Plant	213,456,400	213,456,400	213,456,400
TRR Pipeline	62,809,100	62,809,100	62,809,100
Delevan Pipeline	342,190,000	342,190,000	342,190,000
Delevan Pipeline Discharge Facility	Not Required	13,516,300	Not Required
Sacramento River Pumping/Generating Plant			
Pump Generating Plant	237,068,600	Not Required	237,068,600
Fish Screen Facility	48,914,800	Not Required	48,914,800
Project Access Roads and Bridges	-	-	-
Access Roads (Public and Private)	120,276,900	120,276,900	120,276,900
South Bridge	125,601,000	125,601,000	125,601,000
Electrical Transmission (230kV Option)	23,009,400	14,935,900	23,009,400
GCID Canal Modifications	18,578,500	18,578,500	18,578,500

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**Table 4-3. (Continued)**

<b>Preliminary Cost Estimate Summary - 2010<sup>1</sup> Price Levels (\$)</b>			
<b>Facility</b>	<b>Project Alternative</b>		
	<b>A</b>	<b>B</b>	<b>C</b>
Recreation	2,673,300	2,673,300	2,673,300
Contract Cost <sup>3</sup>	2,227,833,400	2,102,563,200	2,426,544,400
Contingency <sup>4</sup>	445,556,700	420,512,600	485,308,900
Field Cost	2,673,400,100	2,523,075,80	2,911,853,300
Non-Contract Costs <sup>5</sup>	556,958,400	525,640,800	606,636,100
Construction Cost	3,230,358,500	3,048,716,600	3,518,489,400
Environmental Mitigation <sup>6</sup>	112,000,000	112,000,000	112,000,000
Land Acquisition to Take Line	141,071,000	141,071,000	141,071,000
<b>Estimated Total Project Cost</b>	<b>\$3,483,429 ,500</b>	<b>\$3,301,787,600</b>	<b>\$3,771,560,400</b>

Note:

1. Escalated cost using Reclamation Construction Cost Trend Factors
2. Saddle Dams 8a and 8b for Alternative A replace Saddle Dam 8 for Alternative B and C at same location
3. Contract cost includes 10% allowance for unlisted Items
4. Contingency allowance is 20% of contract cost
5. Non-contract cost allowance is 25% of contract cost
6. Environmental mitigation is a rough estimate of the mitigation cost based on the proposed mitigation measures identified in the North-of-the-Delta Offstream Storage Preliminary Administrative Draft Environmental Impact Report

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**Table 4-4. Preliminary Cost Estimate Summary – 2013 Price Levels (\$)**

<b>2013<sup>1</sup> Price Levels (\$)</b>			
	<b>Project Alternative</b>		
	<b>A</b>	<b>B</b>	<b>C</b>
Contract Cost <sup>2</sup>	2,452,434,900	2,314,535,500	2,671,179,200
Contingency <sup>3</sup>	490,487,000	462,907,100	534,235,800
Field Cost	2,942,921,900	2,777,442,600	3,205,415,000
Non-Contract Costs <sup>4</sup>	613,108,700	578,633,900	667,794,800
Construction Cost	3,556,030,600	3,356,076,500	3,873,209,800
Environmental Mitigation <sup>5</sup>	112,000,000	112,000,000	112,000,000
Land Acquisition to Take Line <sup>6</sup>	155,293,200	155,293,200	155,293,200
<b>Estimated Total Project Cost</b>	<b>\$3,823,323,800</b>	<b>\$3,623,369,700</b>	<b>\$4,140,503,000</b>

Note:

1. Escalated cost using Reclamation Construction Cost Trend Factors
2. Contract cost escalated from 2010 price levels presented in Table 4-2.
3. Contingency allowance is 20% of contract cost
4. Non-contract cost allowance is 25% of contract cost
5. Environmental mitigation is a rough estimate of the mitigation cost based on the mitigations identified in the North-of-the-Delta Offstream Storage Preliminary Administrative Draft Environmental Impact Report
6. Land acquisition costs were escalated to 2013 price levels

**Table 4-5. Preliminary Estimated Total Annual Costs – 2013 Price Levels (\$)**

	<b>Alternative A</b>	<b>Alternative B</b>	<b>Alternative C</b>
Estimated Total Project Cost	\$3,823,323,800	\$3,623,369,700	\$4,140,503,000
Interest During Construction	\$1,075,880,900	\$1,019,613,900	\$1,165,134,900
Annual Costs <sup>a</sup>	\$181,655,200	\$172,154,900	\$197,725,100
Annual Operations & Maintenance Cost	\$6,900,000	\$5,600,000	\$6,900,000
Total Annual Cost	\$188,555,200	\$177,754,900	\$203,625,100

<sup>a</sup> Discounted at the federal discount rate of 3.75% over 100 years.

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